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NOTES ON CANNON—FOURTEENTH AND FIFTEENTH  
CENTURIES.

BY CHARLES E. DANA.

(Read April 20, 1911.)

There can be seen to-day in the fair city of Florence, on the Arno, an old yellow parchment, upon which is transcribed an edict dated February 11, 1326. This, expressed in the monkish Latin of the day, gives authority to the Gonfalonier, the Priors, and twelve "good men," to superintend the manufacture of "palloctas ferras et canones de metallo," balls of iron and cannon of metal, which may possibly, in this case mean *brass*. What these cannon for the defence of Florence were like, or what they did, we shall never know, but with them the real history of ordnance begins; these little pop-guns are the ancestors of the 14- and 15-inch B. L. R. (brech-loading rifle) of today; the fathers threw a wee projectile a hundred or two yards; the degenerate offspring throw a shell weighing about a ton, fifteen or twenty miles. That the Florentine guns were the very first no one would assert, but with our present information, only legend lies back of them.

Of course the credit for the invention is given to the Chinese. There is not time here to do more than state that the *Institutes of Timur*, about the middle of the fourteenth century, although they



Cannon of 1390-1400.

One of the earliest representations of a Fire-arm. (From German Codex. Royal Library, Munich.)

give full details of the equipment of his troops, do not mention either cannon or gunpowder. The "*Wuh-li-Siao*," published 1630, says "gunpowder came from the outer barbarians."

The mention of an explosive in the *Sukranita*, a Hindu work said to ante-date everything Chinese, is admitted by experts, I understand, to be a modern interpolation.

The "*Liber Ignium a Marco Graeco Descriptus*," dating back of the eleventh century, gives some 22 to 35 recipes for the so-called "Greek-Fire" etc. No Greek or Moslem writer ever uses the term "Greek-Fire." Col. Hime, an authority on this subject<sup>1</sup> concludes that the earlier recipes in the "*Liber Ignium*," were translated from the Arabic by a Spaniard. The first four recipes are for the compounding of "sea-fire," or, as there described, mixtures which will ignite "when rain falls on them." Quicklime was the cause of ignition; to it was added (C. 1300) sulfur, oil, gum Arabic; (C. 1350) sulfur and turpentine; (C. 1405) sulfur, petroleum, wax. None of these were true explosives.

Berthold Schwartz, of Freiburg, in Breisgau, the favorite German discoverer of gunpowder, made his discovery about 1320 to 1330, at the time the Florentines were popping off their "canones de metallo." Schwartz is said to have preceded the Florentines in the making of cannon but this claim has not as yet been established.

Lieut. Col. Hime undertakes to translate the "*Epistola de secretis*," of the liberal minded Friar Bacon (1214?–1294). This letter is probably earlier than 1249. It is written according to some cryptic method, a bad habit both famous Bacons indulged in, and if the secret of the over-cautious Friar has been guessed with even partial success, we have a right to suppose that while the good Friar was "experimenting with some incendiary compositions . . . the mixture exploded and shattered all the chemical apparatus near it" (Hime. 161). After this smash-up, Bacon could not fail to be convinced that saltpeter, sulfur and charcoal, when mixed in right proportions, had a distinctly explosive tendency—but he never seems to have advanced the next step and discovered the projectile force of the compound.

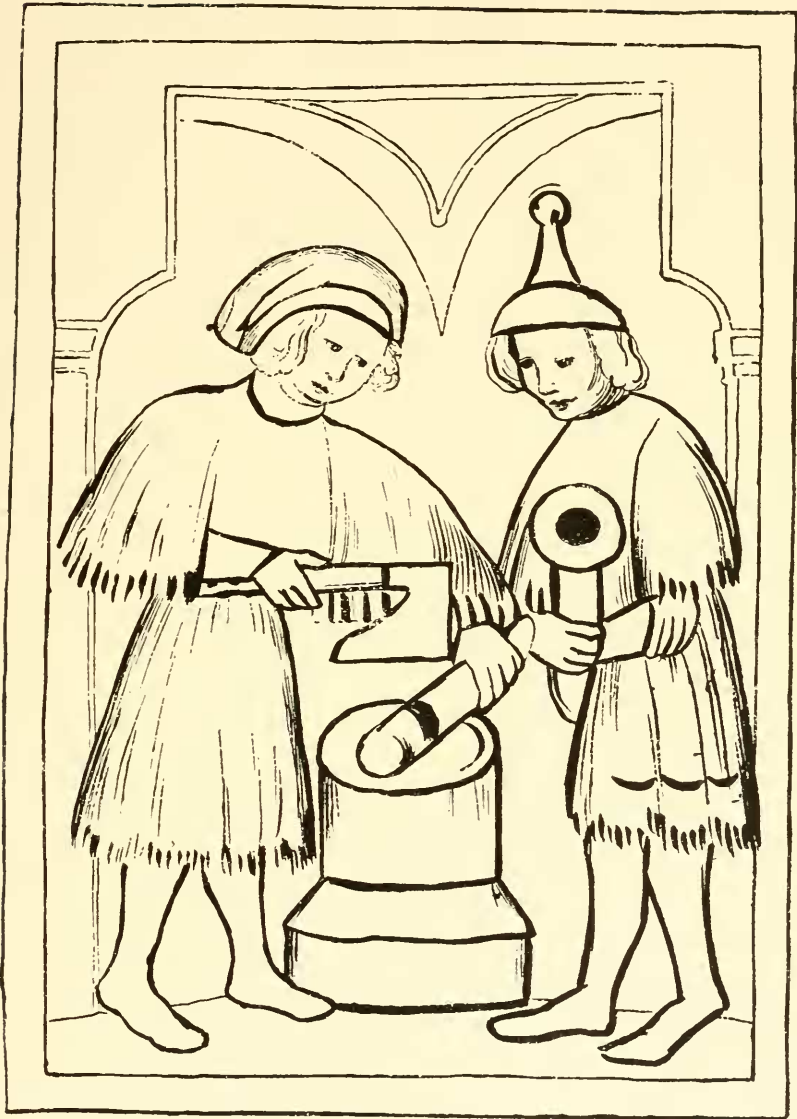
<sup>1</sup> Lieut.-Col. Henry W. L. Hime, "Gunpowder and Ammunition," London, 1904.

A few more words on gunpowder. In early days saltpeter was most difficult to procure; it was collected from cellars and caves; later, depots were established for its reception, while strict laws were passed to ensure its purification and baking. Costing much, saltpeter was very sparingly used, much to the detriment of the gunpowder of course. The proportions differ greatly according to the kinds of powder—whether, for cannon, priming, hand gun, etc., from equal parts of each; to, saltpeter, 3, sulfur, 1 ½, charcoal, 1 ½ to 4: 1: 1. and 6: 2: 1. The formula of today being about 6: 1: 1.

The price of gunpowder in the fourteenth century seems to have been almost prohibitive. Assuming that my figures are correct, which is more than doubtful, for there is no real standard of value, the price was, in money of to-day, rarely as low as twenty-five dollars, and quite possibly, occasionally, as high as fifty dollars a pound; now it costs a quarter of a dollar or less a pound. These prices rapidly decreased with the systematic collecting of saltpeter.

In a campaign the ingredients for making powder were carried separately, and mixed only when need came. Here is a note or two from an authority of about 1465. Keep the three ingredients separate, as the niter and sulfur if mixed soon spoil. Better carry the willow wood unburned, as charcoal absorbs the damp. A secret process for the preservation of powder: Take clear and very strong vinegar, make the powder into a paste; form cakes of four to eight livres (*livre*, about a pound), dry in the shade, sun, or even in an oven. We are getting close to granulated powder. As the usual powder was in the form of a very fine dust, the ignition must have been slow, and much of it was, in all probability, blown out at the muzzle.

The next mention of cannon is in an "indenture" of 1338, between John Starylyng, former keeper of the "King's vessels" (Edward III.) and Hemyng Leget. "Ij [ij] canons de ferr sanz estuff," presumably, without ammunition. Also "un canon de ferr ove ii chambres, un autre de bras ove une chambre." The cannon with two chambers was the form of breech-loader often used even for large bombards until the early part of the next century, and for smaller iron and brass cannon until the art of casting iron guns was well understood (in England not until c. 1545), and even into the



Loading Cannon of 1390-1400.

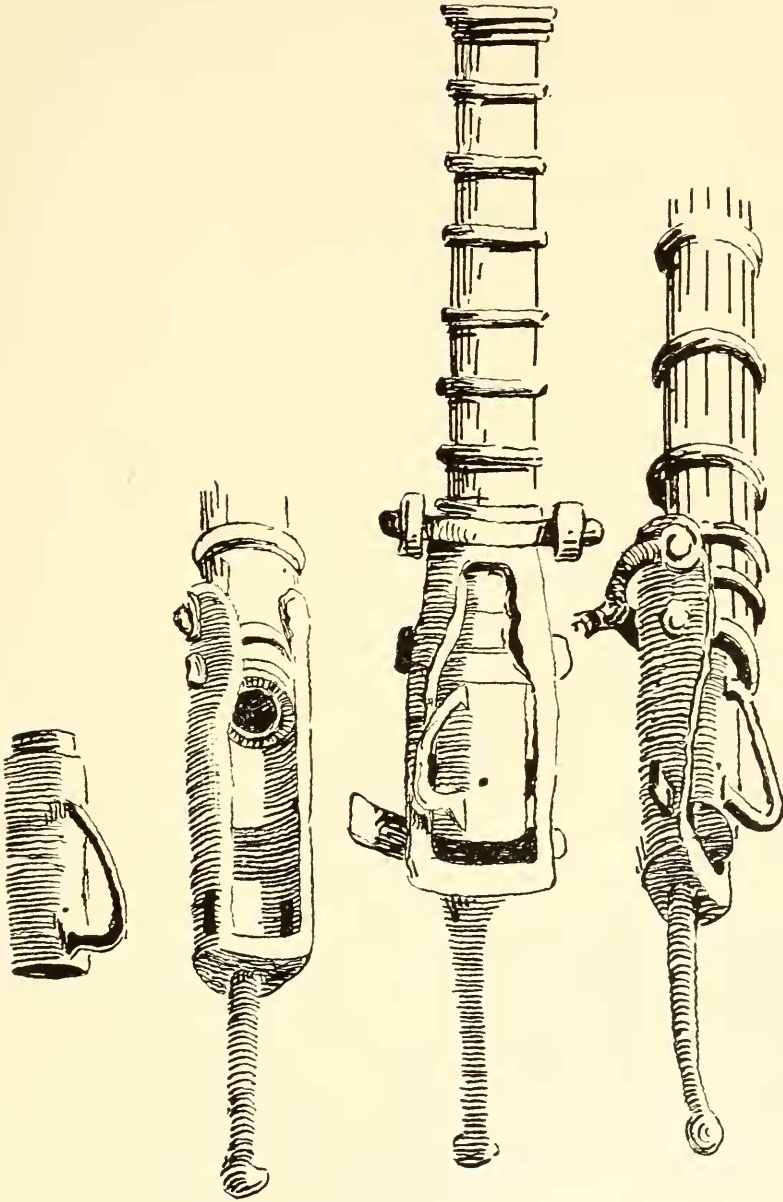
Cutting off wooden Plug for Wad. (From German Codex. Royal Library, Munich.)

seventeenth century, especially for guns used in China. An iron tube was fastened by bands of iron to a strong stock, with a space hollowed out at the breech to hold an iron box, the "chamber," sometimes called "a pot." Later this hollow became part of the gun, a sort of basket, or cradle. The chamber contained the powder charge, upon which a round section of wood was tightly driven as a wad. The projectile was placed at the breech end of the tube, with a straw, felt or rag wad in front to hold it; the chamber was wedged against it, then primed, and touched off with a heated iron rod. Needless to say that a goodly portion of gas escaped between chamber and tube. These were the earliest quick-firing guns, and in the sixteenth century were used on the upper works of the ships, very much as we use quicker firing guns today; the ancient ones, when there were four chambers, say, could be discharged about every two minutes. Later they will be called "murtherers"; and well they earned the name when the projectiles consisted of rusty nails, bullets and scraps.

The chambers, or "canones," for the huge bombards, which we shall meet with later, were held in place by heavy timbers. By or before 1400 the heavy, wrought-iron powder chamber was welded or screwed onto the chase of the bombard.

In the year 1338 appeared, in the Arsenal of Rouen, a terrible engine of destruction, called by its proud keepers, a "pot de fer à traire garros," an iron pot for throwing arrows. These arrows, much like cross-bow bolts, were tipped with iron and winged with brass, the latter metal obtained from kitchen utensils, cut up and melted for the purpose. The projectile was wound with leather to make it fit snug in the barrel. The powder charge for this dread engine of war was about seven tenths of an ounce of the ill-proportioned powder of that day. When all was prepared, and fire was applied, the bolt of destruction no doubt emerged, but certainly with considerable reluctance.

A recipe of a few years later enables us to approximately figure out the cost of cannon of that day. Five cannon of wrought-iron weighing 25 lbs. each, and five "canon de metal," presumably brass, cost three hundred dollars of to-day, say \$30 each. All of which is submitted with considerable hesitation.



Chamber-Piece, 1338-c. 1700.

Chamber or "Pot," to hold powder charge. Cradle and Breech of Chase. Tail for pointing. Chamber wedged in place; part of Chase removed to show Projectile. Side-view showing means of horizontal and vertical motion.

The first mention of cannon by Froissart, who is as "faithful as an eye witness," is in the year 1340 at the siege of Quesnoy, on the northeast border of France, not very far from Valenciennes. "Those of Quesnoy let them hear their cannons and bombard, which flung large iron bolts in such a manner as made the French afraid of their horses."<sup>2</sup>

The earliest English use of this word *bombard* given by Dr. Murray, is in a quotation from John Lydgate, 1430: The noun has left us, but the verb, *to bombard* still lingers.

It is usually asserted that the first field-guns were used at the battle of Crécy, August 26, 1346. The Florentine chronicler, Giovanni Villani, remarks, in the somewhat florid manner of the time, "the bombards of the English made balls of iron to leap with fire, to frighten and drive off the horses of the French. . . . That the roar of the bombards made such a trembling of the earth, such a noise, that it seemed as if God thundered, with great slaughter of men and beating down of horses."

This terrible slaughter must have been produced by three small toys somewhat like blunderbusses, the charge for each of which was an ounce, more or less, of very bad powder. Cause and effect do seem disproportionate.

The "Grandes Chroniques de St. Denis" assert that it was the three cannons of the English that spread panic amongst the Genoese cross-bowmen and made them indulge in the singular antics by which they sought to frighten the English archers. In only one known copy of Froissart is there any mention of cannon at Crécy; this happens to be that in the library of the city of Amiens, not far from the battlefield; there is some reason to believe that the words in question are an interpolation; when one remembers that from Falkirk (1298) to Flodden (1513)—Bannockburn excepted—the English archer, firing ten or more armor-piercing projectiles a minute, with an effective range of 250 yards, was always victorious, it does appear possible that French writers, with more patriotism than truth, introduced these terrible cannon into their accounts of the battle as an excuse for the crushing disaster to their arms.

Edward III. took with him several cannon when he entered

<sup>2</sup> Chap. IV., Book I., p. 40.



France, July, 1346, the month before Crécy. We have too the King's Privy Wardrobe Accounts, as they were termed, giving lists of guns, ammunition, gunners and other details of the ordnance sent from the Tower of London to be used at the siege of Calais, which followed the battle of Crécy.

At this siege of Calais only leaden projectiles are mentioned, and from the very moderate amount of ammunition required for their propulsion, the guns although called "great" must have been exceeding small. The main reliance of besiegers and besieged continued to be in the huge engines for hurling masses of rock and other unpleasantnesses.

The derivation of the word *gun* is not without interest. Consulting both Murray and Skeat, we find that *Gunnhildr* was an Icelandic, female, proper name, once applied to war engines. As *Gunn* (Icel. *Gunnr*) signified *war*, and *hildr* a *battle*, it was certainly appropriate. An account of the munitions in Windsor Castle, 1300/01, mentions a large ballista named "Domina Gunilda." As there does not seem to have been any great lady, famous or infamous, so called in the fifteenth century, this is quite probably a survival of the old Scandinavian name. The M. E. word *gunne*, is, of course, but a shortened pet name for the fearsome lady.

Here is one of the early tragedies connected with cannon. In 1346, the year of Crécy, Peter of Bruges had established a high reputation for the making of "connoiles." The word may come from "tonnoiles," which in its turn, may have come from "tuyaux de tonnoire," or tubes of thunder. In September of that year the consuls of the city of Tournay hearing that connoiles were useful to be let off in a good town when besieged, desired the aforesaid Peter to make them one as a sample, and if it proved satisfactory they would give him an order for more. Peter, the thrifty burgher, did make one and then proceeded to show the worthy consuls what it would do. The connoile was placed with great care, outside the gate "Noire aux Champs." Peter states in his own account that he loaded the connoile with a quarrel, meaning in this case a heavy bolt, not an altercation. To the quarrel Peter affixed two pounds of lead. From the subsequent happenings there is reason to suppose that he did not omit powder. Peter "laid" the connoile so that it

pointed against a door and wall. The spectators heard a "cruel noise," but the antics of the connoile remain a mystery.

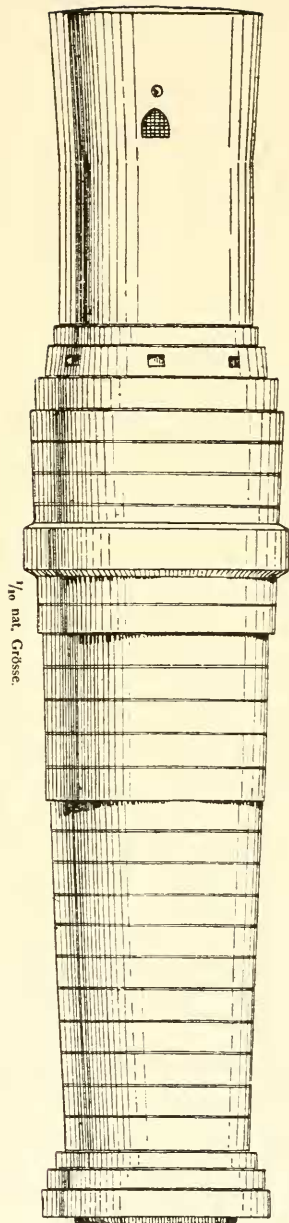
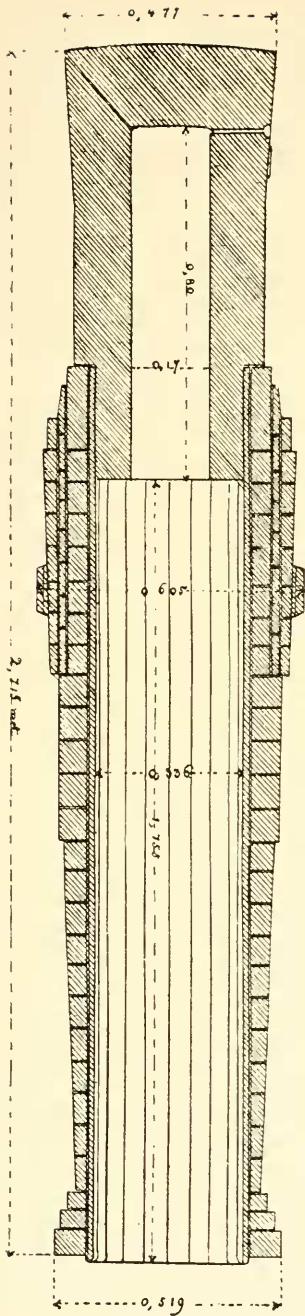
In quite another part of the city of Tournay, an industrious fuller was busily at work; when lo, along came the erratic quarrel, with its two pounds of lead,—and the guild of Fullers gave their deceased brother one of those picturesque funerals for which the good town is so celebrated. When Peter of Bruges heard of this mishap, he fled into sanctuary and gave himself up for lost. Then followed a solemn session of the consuls. Contributory negligence could not be charged against the Fuller, for if ever bolt came "from the blue" it was this one. After a long discussion the conclusion arrived at was: Peter of Bruges fired the connoile at the order of the consuls; he was not known to have harbored any ill feeling against the fuller;—they might have added that neither ill feeling nor skill in aiming would have enabled Peter to hit the far-off fuller. The consuls thereupon held Peter blameless, merely remarking that the event was a misfortune and a sad pity.

A curious point is brought out by the list, dated 1347, of artillery, in its broader sense, for the defense of the castle of Brioul in France. At the far end of the list we are told that one man managed two cannons, and that the efficiency of their projectiles, and of stones thrown from the towers *by hand*, was considered about equal.

Before glancing at the great bombard of Caen, 1375, which marks a considerable step in advance, let me say that during the fifty years we have glanced at, there have been cannon of wrought iron, occasionally of brass. The largest of the former did not weigh over 120 lbs. Breech-loaders were common, and the projectiles were bolts, or balls of lead—iron balls are referred to, but never stone.

March 20, 1375, an order was received at Caen, in Normandy, from Jehan Le Mercier, one of the King of France's councillors, for the building of "a great cannon of iron." March 21 work began by erecting three forges in the market place, and surrounding them with a wooden paling to keep the curious at a proper distance.

March 22, the four smiths with their eight helpers began to draw wages. Fifteen men worked for six weeks, sometimes at night. April 3, Jehan Nicolle, a master smith, said to have been the best in Normandy, arrived from "Sap." 2,110 pounds of wrought iron,



Built-Up Wrought-Iron Bombard, 1420-1430.  
 Length 8 ft. 6 in. Caliber  $1\frac{3}{4}$  in. Basel Arsenal.

and 200 pounds of steel were used. The inner tube was formed by longitudinal bars; encircling these were tight-fitting rings of iron, driven on, one touching the other, till they formed an unbroken surface. 400 pounds of the iron was Spanish, presumably a better quality. The "cuve" for which it was used, may have been that part of the breech which enclosed the powder chamber. 200 pounds of steel were needed; could the chamber have been of that metal? The chamber seems to have formed a permanent part of the bombard, as the vent is specially mentioned with its large projecting apron of iron.

After the metal part was finished ninety pounds of rope was wound about the gun, for what purpose we are not told. Over this was sewn a cover of hide to prevent the rope rotting or the metal rusting if exposed to rain.

The manner of attaching the monster to its heavy wooden bed and braces, is fully and confusedly described. General Favé thinks its carriage was a kind of cage, somewhat like that used by blacksmiths in France for shoeing unwilling animals. Four stone balls, size not given, were provided, at a cost of two sous six deniers each (\$1.50? today). Two of these were used in the proof rounds.

After this date (1377) the size of cannon rapidly increased. Froissart mentions 140 cannon used at Odruiik or Outherwyck, by the Duke of Burgundy, in 1377, which threw balls of 200 pounds. A work (name not given) professing to quote contemporaneous authority, mentions a cannon of the Duke of Burgundy, 1377, throwing a shot of 450 pounds, which would require a calibre of say, 21 inches.

1382, at the siege of Oudenarde by Philip van Arteveld, the Flemings made use of a "marvellously great bombard," so they said, at least. They added, that when this bombard was fired, by day it could easily be heard a distance of five leagues, and by night ten. It made such a terrible din (French "noise") that to those who listened, it seemed as if all the devils in hell were rushing on. The rather imaginative old chronicler says that this monster had "53 pouces de bec" (mouth). Englished, a trifle over 58 inches. Either we must credit him with having measured the circumference, —rather an unusual manner of classifying artillery, making the real

caliber only about 18 inches, or else,—but the alternative is too painful.

The accounts of the fighting about Chioggia, 1380, between the Genoese under Pietro Doria, and the Venetians under their beloved Vittore Pisano, are well authenticated, and give a vivid picture of the power of these old bombards. January 22, the great bombard, a two-hundred pounder, was fired by the Venetians at the campanile of Brondolo; it knocked out a large piece of wall, and some of the flying stones struck and killed Pietro Doria, the Genoese commander, together with his nephew. The next day the same bombard brought down a still greater piece of the same campanile, killing 22 men; so that as an implement of slaughter, the clumsy thing was a success and endeared itself proportionately to the Venetians.

Before leaving the fourteenth century a few short notes might be added.

The castle of Tannenberg, in Germany, was captured 1399. A huge bombard belonging to the city of Frankfort a/M., was loaned to the besiegers. Tremendous difficulties were met and overcome in getting the gun into position, very close to the castle. The first projectile stuck in the wall; the second passed through, and soon the defences were in ruins. These were never rebuilt. Excavations were made in 1849 and many stone balls were found. They varied in diameter from three inches to 31½ inches, the latter weighing 825 pounds, and unquestionably one of the shot for the "Frankfurter Buechse."<sup>3</sup>

Napoleon gives an inventory of the Artillery of Bologna, 1381/97, in which stone balls of 1,000 pounds for bombards and mortars, together with iron balls of 1, 2, 3 and 6 pounds are mentioned.

A word about *field-guns*. Froissart,<sup>4</sup> speaking of the capture of the castle of *la Roche sur Yon* (1369) by the Black Prince, mentions "several cannons and springalls with which the army was provided, and from long custom had always carried with them."

In the year 1382 the bumptious burghers of Bruges were engaged in one of their usual wars with their equally bumptious neighbors

<sup>3</sup> "Die Burg Tannenberg und ihre Ausgrabung," Hefner und Wolf, Frankfurt, a/M., 1850.

<sup>4</sup> Chap. 268, Vol. I.

of Ghent, who took the field 5,000 strong with 200 "ribaudequins." The latter were heavy built push-carts—Napoleon calls them "wheel-barrows," bearing in front two or three, sometimes more, of the small cannon of the day, with an ugly fringe of bristling lances projecting beyond. These disagreeable field-pieces were trundled along in front of the line of battle. The effect of two lines of "ribaudequins" meeting and neutralizing each other must have given rise to some curious tactics in battle. In this case the 5,000 of Ghent formed themselves into a dense mass and with "ribaudequins" in front, drove off 40,000 men of Bruges.

At the battle of Roosebeke, November 27, 1382, where the Flemings were cut to pieces by the French and their leader Philip van Arteveld killed, Froissart states that the battle began by "a cannonade with bars of iron and quarrels headed with brass."

This battle did not end the war, and a curious picture of the ineffectiveness of the smaller cannon of the day is given by Lieut. Gen. Sir Henry Brackenbury, in his account of the siege of Ypres by the English and Flemings. The siege lasted from the eighth of June, 1383, to the eighth of August. During that time a steady cannonade was maintained, but apart from interfering with the sleep of the good burghers of Ypres, not a soul was one whit the worse. Two guns were advantageously posted in front of one of the gates, and kept up a steady fire, in all 450 shots. When the siege was raised those of Ypres were forced to admit that the gate in question was in need of immediate repairs. Much danger to the inhabitants was avoided by a thoughtful device; the besiegers considerably heralded by a trumpet blast each discharge; this enabled promenaders to step aside and avoid any possible annoyance from intruding cannon balls.

Another curious picture of by-gone days is given us in the "Issue Roll of the Exchequer for 1384," in which the amount of payments for the hire of cannon and cannoniers is given, making it plain that private individuals often owned one or more cannons which they hired out like cabs.

Viollet le Duc mentions this same custom on the continent; he says that during the middle ages the engines of war were made by non-military workmen, and the same rule prevailed after the intro-

duction of cannon. Not only did ordinary mechanics make the new artillery, they also served it; letting their cannon for hire as one lets carts and drivers; and it was not until the death of Charles VII, 1461, that they formed companies of bombardiers and culveriniers, heavy and light artillery, like the companies of cross-bowmen and archers, gave to them military organization, and placed them under the command of the grand master of artillery.

The fifteenth century was one of development, very important but less startling than its predecessor.

The most marked advance was in cast bronze and iron guns. Pretty much any date after 1400 may be taken as the beginning of that phase of the smelter's art. Erfurt claims 1377 as her beginning; it seems needlessly early, but no one can say her nay. There are two cast-iron guns in the Leipzig Museum, one between 1400 and 1420; another, less archaic, 1420 to 1430.

Francis Grose says:

It seems extremely strange, that none of our workmen attempted to cast them, [cannon] till the reign of King Henry VIII. when in 1521, according to Stowe, or 1535 [Camden says], great brass ordnance, as canon (sic) and culverins, were first cast in England, by one John Owen, they formerly having been made in other countries; . . . 1543. . . [Stowe] . . . the King minding wars with France, made great preparations and provisions, as well of amunitions and artillery as also of brass ordnance; amongst which at that time, one Peter Bawd, a Frenchman born, a gun-founder, or maker of great ordnance, and one other alien, called Peter Van Collen, a gun-smith, both the King's freedmen, conferred together, devised and caused to be made, certain mortar pieces, being at the mouth, from eleven inches up to nineteen inches wide. . . . and after the King's return from Bullen [Boulogne], the said Peter Bawd by himself in the first year of Edward VI. [1547] . . . did also make certain ordnance of cast yron of diverse sorts and forms, as fawconets, falcons, minions, sakers, and other pieces. Chamber'd pieces for throwing stones, called cannon-perriers, port-pieces, stock-fowlers, sling-pieces, portingale-bases, and murtherers, were about this time much used in small forts and on shipboard.<sup>5</sup>

Of course all these guns were cast hollow; that is a core covered with clay, was suspended in the center of the mould while the metal was poured in. Despite all precautions it was very nearly impossible with the imperfect means then in use, to keep this core in place and true; cavities formed in the metal about it, and the scoria did not

<sup>5</sup> Francis Grose, "Military Antiquities." London, 1788, II., p. 383.

rise freely; certainly too much cannot be said in praise of the founders who could cast such a gun as the serpentine of Charles the Bold (say 1476), in the arsenal at Neuveville, near Bern; a cast-iron field gun some fifty-two inches long, and 2-inch bore.

Machinery for boring cannon is said to have been invented by Lew, in Switzerland. It was introduced into France 1740/44, by Jean Maritz, born in Bern (1711-1790), who, after accepting office under the French was naturalized. Maritz seems to have been the first who thought of placing the gun horizontal and making it, not the drill, revolve.

The Great Bombard, the characteristic gun of the latter half of the fourteenth century and the greater part of the fifteenth, was often, in its early days but a huge tube—"tuyeau de tonnerre." It is possible that after the frequent burstings, the occasional survivor noticed that these annoying accidents usually had their origin just in front of the chamber, about where the great stone ball was placed. The gun-maker would naturally strengthen this portion with much thicker bands, and doubtless he would soon deduce the fact that the strain decreased from the bursting point to the muzzle, then he would shape his gun to suit. The early gunners suffered terribly from the bursting of their guns. James II., King of Scotland, was killed at the siege of Roxborough Castle, 1460, in this manner; 1470, a bombard near Paris burst, killing 14 men and wounding as many more.

It was long before the early gunner discovered (the figures are for a 4.25 inch caliber) that the proportional pressure on the bore increased alarmingly with the weight of the ball; 3.6 per square inch for stone; 10 for iron; 10.9 for bronze; 14.5 for lead. For the same caliber; the cost for one round; 4-inch ball, charge 1-9 wt. of ball:—In money of to-day: with a stone ball, \$1.25; iron, \$4.75; lead, \$6.25; bronze, \$9.00.

Stone balls had two bad defects—they were apt to shatter to pieces when used for breaching purposes against heavy masonry; and their rough surface greatly damaged the interior of the bombard; it was sought to correct these defects; the first by bands of iron about the ball; the second by enclosing the ball in an envelop of soft lead.



The difficulties in the construction of these big bombards were greatly lessened by the system of forging the very heavy breech piece so that it could be screwed to the chase—and unscrewed, when desired; the square holes for the levers, that worked like capstan bars on board ship, are conspicuous in such guns, usually in the rear ring of the chase, and at the rear end of the breech. In some bombards there were three divisions, greatly adding to convenience in transportation.

Here are the dimensions of the largest bombard that has come down to us, the one on the Place du Marché at Ghent. The lady is called "Dulle Grete," which they tell me can be translated "Mad Meg." Her caliber is 26"; interior of chase 10' 4", or five calibers. Chamber caliber 10.23", length 4'-6.16"; five to six calibers. The exterior length 16' 6". The gun is built up of 32 longitudinal iron bars, 2.17" wide, 1.2" thick; these are soldered together. Over them are 41 iron rings, welded together and diminishing in thickness from the junction with the breech to the muzzle, except the three which form the muzzle moulding or swell. In addition, there are 20 bands, called "rondelles," in two of which, the one at the extreme end of the breech and the one at the end of the chase, are holes for the levers used in unscrewing breech from the chase. Curiously enough, the breech is not exactly in line with the chase, inclining slightly to the left,—might possibly be a trifle trying for the right-hand side of the chase after a few shots. Meg's weight is 36,080 pounds, but painters of that day represent Flemish women of her class as distinctly heavy. The ball weighed 748 lbs., and the powder charge was 88 lbs., between  $\frac{1}{8}$  and  $\frac{1}{6}$  the weight of the projectile. The range was about 3,000 yards, at least Meg claimed that, though her effective range could not have been more than three hundred yards. But, it is only fair to remember that in Nelson's day six hundred yards was long fighting range.

The date of this huge, but rather useless engine of construction—destruction, I fear, would be gross flattery—is rather uncertain. The Flemings took it to the siege of Oudenarde, in 1452; a coat-of-arms I found near the vent is that of the father of Charles the Bold, called "Philip the Good," because he was bad. He warred from 1422 until 1467.

At the siege of Caen, in 1450—this is all quoted from an account in very bad Latin—the town was ringed about with twenty-four bombards, horrible to behold, for they were of such immense size that a man could sit in any one of them without bending his head! Possibly this old chronicler's account was intended to fall into the hands of the besieged—though of course, cannon of that size would make very comfortable quarters for at least 48 men.

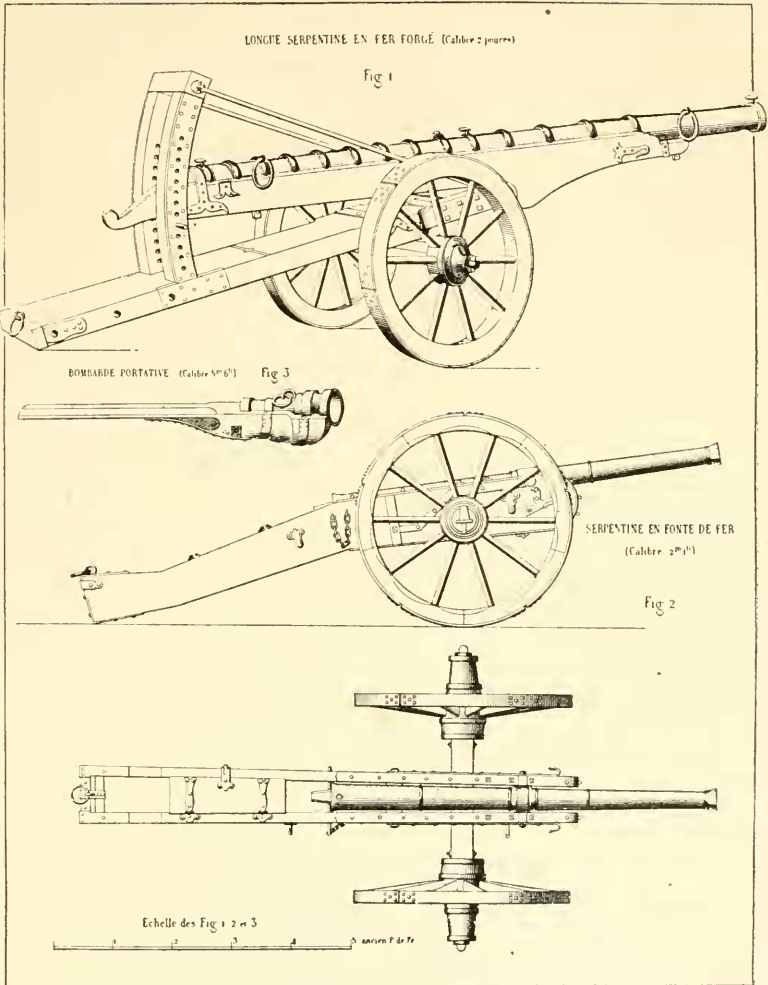
The preceding is but a dip into the doings of bombards; we have not touched on that most interesting one, "Mons Meg," at Edinburgh Castle; nor the "Michelettes," at Mont St. Michel, which are of unique value; the "Faule Mette," was a cast bombard, a resident of Brunswick, but alas she has disappeared.

Wooden guns are of great interest, not only on account of the frequent tendency to burst which must have been theirs, but also on account of the very unreliable descriptions of them that we possess.

About 1450 trunnions appear (not the first, by any means) on some of the Burgundian guns, adding, of course, greatly to their efficiency, both in permitting more exact aiming and as a help to resist the recoil. Omitting all other technical details it may be of interest to take a look at the Burgundian, and afterwards at the French artillery.

The town of Neuss, near the Rhine, and not far from Duesseldorf, was unsuccessfully besieged by Charles the Bold, 1474/5. The Burgundian artillery, then the best in Europe, was well represented there, and, more or less careful accounts of it have come down to us. The following list is taken from Napoleon's "Etudes"; unfortunately the calibers are omitted.

Nine large bombards. Eight bronze bombards, 8 to 11 ft. long; these had lions' heads at the muzzle. Ten courtaux, 4 feet long, on wheels. These were a little like the carronade of just before 1800, to forty or fifty years after; there are accounts of courtaux which carried 60-lb. balls and were used as siege pieces. 115 Serpentes, one of which was 13 feet long. Six serpentines of bronze, with dragon heads at the muzzle, one of these guns was 8 feet long. Sixty-six serpentines 6 to 9 feet long. Fifteen others of the same caliber weighing 4,000 pounds.



Field-Guns of Charles the Bold, c. 1476.

FIG. 1. More ancient build; wrought-iron bars, banded. FIG. 2. Cast-iron: modern looking gun and carriage. FIG. 3. "Portable bombard"; throws incendiary bomb or stone ball.

Like many other weapons, artillery is not of much service unless you know how to use it, and do not hesitate to use it. Charles the Bold was the last of the knights-errant, unless we include the chivalric Don Quixote. Cannon had changed all that and Charles was a failure, though a magnificent one.

March 2, 1476, was fought the battle of Granson; Charles of Burgundy had 20,000 men and his splendid train of field-artillery; both these he proceeded to post as badly as he conveniently could. The Swiss always attacked in solid squares, impervious to cavalry but just the food for cannon to devour. Nine thousand men, and absolute silence, save the word of command; instant death to whoever faltered. A few shots took effect on that solid human mass, as it moved slowly towards the guns, each ball mowing down ten or a dozen men; then a dip in the ground protected them, and the balls passed over their heads. Now was the time for Charles to have concentrated his artillery fire on the square and rent it to pieces, for his cavalry to drive off the field. Instead, time and again he launched his magnificent gendarmerie against that bristling wall of steel, those 16-foot spears held by sturdy mountaineers who knew not fear. Every attack failed, panic followed, and that splendid Burgundian artillery now adds interest to a score of Swiss museums.

Napoleon III. and General Favé consider the artillery of Charles VIII. the beginning of that arm of the French service. Of course guns of earlier days still lingered on, but the newer ones took on almost the form they were to retain for three hundred years.

Guns changed but little from 1500 until the astounding development of today. Drake fought the Spaniard with almost the same guns that Nelson used at Trafalgar.

A better organization, and an improvement in tactics was made by Charles of France, before his great Italian campaign of 1495. On the other hand he was opposed by very different foes from the heroes who defeated Charles of Burgundy at Granson, Morat and Nancy. One may safely say that France easily, almost pityingly scattered before her powerful guns the very worst troops the world contained at that time. Burgundy, on the contrary, had faced the bravest and best fighters history tells of. Swiss tactics, the old phalanx of Greece, steadily adhered to, soon became obsolete, and the system of rushing the guns with such unwieldy squares, received its death blow on the days of Marignano, 1515; when, cannon to the right of them, cannon to the left of them, cannon in front of them, volleyed and thundered. Two days of carnage failed to shake the Swiss; but when Francis I., massed his artillery, and the

Swiss attack was exposed to a cross fire that tore their squares to shreds,—just what Charles of Burgundy should have done at Granson, they sullenly fell back and the rule of the cannon began; alas, that its end is not yet in sight.

Ten years later this same Francis was routed and captured at Pavia; one reason for it was that he stupidly masked his own guns by advancing his troops in front of them; another, that many of the Swiss of Marignano were then fighting on his side; but those days of Marignano and the slaughter were not forgiven; so when the crisis came, the Swiss, despite the despair and entreaties of their officers, threw down their arms and pretended to be cowards,—for a Swiss it *could* only be *pretence*.

#### AUTHORITIES.

- "Ancient Cannon in Europe" (fourteenth century), Lt. Henry Brackenbury (Later Lt.-Genl.), *Proceedings of the Royal Artillery Institution*, 1865, Woolwich, Eng.
- "Etudes sur l'Artillerie," Prince Louis Napoleon, Paris, 1846.
- "Etudes sur l'Artillerie," General Favé, Paris, 1862.
- "Quellen sur Geschichte der Feuerwaffen," Leipzig, 1877.
- "Military Antiquities Respecting a History of the English Army," Francis Grose, London, 1812.
- "Principles and Practice of Modern Artillery," Lt.-Col. C. H. Owen, London, 1873.
- "Gunpowder and Ammunition," Lt.-Col. H. C. L. Hime, London, 1904.
- "Naval Gunnery," Capt. H. Garbett, London, 1897.
- "Catalog of the Musée d'Artillerie," Paris.
- "Encyclopedia Britannica."
- "Encyclopedie Larousse."
- "Dict. du Mobilier Français," Viollet le Duc.
- "Biographie Nouvelle."
- Author's notes, etc.